Troubleshooting Internet

Whether you work from home on a single [PC](#) or you manage [small business networks](#), chances are good that, at one time or another, you've opened a Web browser and instead of being greeted by Google you got "Page Not Found." Fortunately, [troubleshooting](#) a downed Internet connection isn't as intimidating or as complicated as it seems.

Whether it's one PC or many, the rules and techniques for troubleshooting Internet problems are basically the same. All it takes is some patience and a bit of common sense. I'll highlight the basic steps to take the next time your small [business](#) network fails to connect to the Internet.

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• Step 1: Restart Your PC and Router

- It might sound like the obvious starting point, but you'd be surprised how many people don't try this before sounding the alarm. Yet a simple reboot can actually resolve many of the everyday issues you run into, including a flaky network connection.

- Shut down all of the relevant hardware, which includes the PC, [the router](#) and the ISP's modem. In some cases the router and modem are integrated into a single unit. And obviously if none of the other [PCs](#) in your environment are having this issue you don't need to reset the modem and router, but always try rebooting the computer.

- Once you shut down everything, wait at least 5 minutes and restart the devices in this order:

- Restart the router. Again, wait 3 - 5 minutes. You may need to do this as long as 20 minutes depending on the model (Some netgear models cache IP information for up to 20 minutes)

- Finally restart your PC, and try to get online.

- In most cases, that will do the trick. If not, then you need to search for other possibilities.

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- ## **Step 2: Isolate the Network Problem**
  - Isolating the problem is not just saying, "I can't get onto the Internet." That's just a symptom or a result of the problem. To resolve it, we need to discover the cause of the problem. How do we do that? Like a good detective, we investigate and ask questions.
  - For instance, is your machine the only one having the problem, or is it all of the PCs on the network? If it's just your machine then it's probably not the Internet connection itself, but a problem exclusive to your system. On the other hand, if the problem is affecting multiple PCs, then you need to look for other factors, such as how those machines are connected to the Internet. Are they using a wired or wireless connection?
  - If they all use a [wireless connection](), then it could be a problem with the [access point](). If instead they all use a *wired connection*, then it might be a problem with the [switch](). If both the wired a*nd* wireless PCs are affected, then it could be a problem with the router or the [ISP]().
  - In some cases the problem might occur using Internet Explorer, but not when using Google Chrome. This could indicate a problem with the Internet Explorer application itself. In other cases you might not be able to browse the Web, but you can still get email. That would indicate that your Internet connection is fine, but something is blocking *HTTP data traveling over port 80*, but not *email traveling over port 25*. This might lead me to suspect a firewall issue or possible virus or malware infection. Once you identify the potential problem area, you can begin troubleshooting.

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- **Step 3: Follow the Network Path**

    Make sure you have the correct IP scheme for your network. This would include the: IP Address
    Subnet Mask
    Default Gateway
    DNS Servers

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- There are a few ways you can see what IP addresses are being assigned.
  But generally for: Win9x - Start / Run / command
  Windows2000/XP/Vista - Start / Run / cmd
  Windows7 - Start / CMD

- The run IPCONFIG /ALL. A sample where a router is used is in the following graphic

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- **IP Address:**
  If you have a router, common examples would be: *192.168.x.x, 172.16.x.x or 10.x.x.x* If you are directly connect to the ONT, you should have an IP address that would correspond to something from your [ISP](ISP).

- For us this is 38.65.x.x

- What you *don't* want to have is something like *169.254.x.x*. This means you are not getting and IP address assigned and needs to be resolved first.

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- Incidentally, the above IP's are not routable to the Internet. If a customer has one of these IP's and is directly connected to an ONT the connection will not work.

- The 169.254.x.x. address is due to APIPA. APIPA enables a computer to automatically assign itself an IP address when there is no DHCP server available to perform that function. You see, when a DHCP client boots up, it first looks for a DHCP server in order to obtain an IP address and subnet mask. If the client is unable to find the information, it uses APIPA to automatically configure itself with an IP address from a specific range that has been reserved especially for Microsoft by the Internet Assigned Numbers Authority (IANA). That IP address range is 169.254.0.1 through 169.254.255.254.

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- **Subnet Mask:**
  Also make sure you have the correct *Subnet Mask*. Most commonly this would be 255.255.255.0 for private IP addresses
- For us this would be 255.255.254.0

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- **Default Gateway:**
Make sure you have the correct *Default Gateway* IP address.
With a router, this is typically the IP address of your router.

- For direct connections to the ONT this will be 38.65.96.3

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- **DNS Servers:**
Make sure you have the correct *DNS Servers*. Sometimes this is the IP address of your router, so it would be the same as the Gateway IP.

- Sometimes (as in this example), it is the actual DNS servers used by the ISP.

- For us this is 66.28.0.45 and 66.28.0.61

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- Possible causes for not getting an IP address assigned are: 1. Defective cable, network card or port on the router. Make sure you are using all known working components.

   2. Your router is not configured for DHCP (which would automatically be assigning IP addresses).

- But you need to have this working before proceeding.

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- So what is this DHCP anyway?

- DHCP stands for Dynamic Host Configuration Protocol. This is enabled by default on most home devices (PC's and routers). This allows the device to go to the gateway and request an IP. The gateway either hands out an IP from a predefined range or directs the computer to another device for the same function.

- This is supposed to offer the user the freedom from configuring things by hand.

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- **Step 3: Follow the Network Path**
- Basic Ping Testing
- This and can be done from that same command prompt you used to run IPCONFIG
- Try pinging the router's IP address e.g. *ping 192.168.1.1*
- If you get a reply, then your connection to the router is working.
- If you don't get a reply, then you need to double check your network card, cable, port on the router. You might also see if any other computers on the network can do the same

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- Try pinging an external site by IP address e.g. *ping 8.8.8.8*
- If you get a reply, then you have a connection to the Internet.
- If you don't get a reply, there are several things you can try:
- 1. Double check that the router is connecting to the Internet. Typically you can access the router through your web browser and check it's status. Using the gateway address from IPconfig
- 2. Take the power off your DSL/Cable modem and Router. Plug the modem back in a wait a minute or so. Plug the router back in and wait a minute or so. Then restart your computer.
- 3. Winsock Fix - It is possible that the Winsock Registry entries have gotten corrupted. This is typical for Windows XP and earlier. This usually indicates a problem with the Operating System and a full system restore will likely fix the problem.

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- Try pinging an external site by Name e.g. *ping* [*www.yahoo.com*](www.yahoo.com)
- If you get a reply, then you have a connection to the Internet and DNS is working
- If you don't get a reply, there are several things you can try:
- 1. Double check your DNS entries
2. You many need to use the same DNS IP address that your ISP or Router is using.
3. On rare occasions your ISP has problems with their DNS servers. But that is rare in comparison to misconfigured computers.

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- So what is this DNS thing anyway?
- DNS stands for Domain Name Server. Think of it as a large telephone directory. Instead of mapping names to telephone numbers it maps domain names (i.e. Yahoo.com) to IP numbers. This is because computers work with numbers and not names. Humans are the opposite.

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- **If your PING tests work but you are having problems browsing sites on the Internet**

- If you could ping external sites by both IP address and Name, but cannot browse the web, likely your web browser is misconfigured.

- Double check that you don't have an incorrect or not needed Proxy server assigned. For the Internet Explorer - Tools / Internet Options / Connections tab / LAN settings button. Uncheck both *Automatically detect settings* and *Use a proxy server for your LAN.*

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- **Step 4: The "X" Factor**
- The "X" factor is that unknown variable you can't easily identify. When trying to discover the "X" factor you need to ask yourself "what changed on the system before this problem started?" For instance, have you recently installed any new hardware or software? When was the last time you ran a Windows Update? Did it install any new drivers? Were you deleting or uninstalling any applications that might have affected the system? The answers to these types of questions can provide you with important clues for tracking down the source of your problem.

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- Another "X" factor candidate is a virus or malware infection. In many cases where everything seems to be functioning correctly, yet you still can't get the system online, you may be dealing with a virus. I've seen infections change home pages, prevent certain search engines from loading and even disable Internet Explorer entirely.

- In these situations your best bet is to run a virus scan from outside of the operating system using a rescue CD such as the AVG Rescue CD or the F-Secure Rescue CD. If you're system's infected, these applications should help to expose and expel them.

- As a last resort, using Windows built-in System Restore program to revert the system back to an earlier configuration can sometimes be the simplest and quickest way to restore conductivity.

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- **Step 5: Minimize the Complexity**
- When it comes to troubleshooting, try to keep things as simple as possible. For instance, if you're having problems establishing a wireless connection, it's always best to disable all of the security encryption while attempting to get online. Encryption only adds another layer of complexity to an already complex problem. Get it working first, and then protect it.
- In a home-office environment, if you're having trouble getting a PC online and its connected to a router and/or a switch, always connect the modem directly to the PC and verify that the problem still exists. If it does, then the problem lies with the modem or it's a backend problem with your ISP. If however the PC can now get online, then it's most likely a problem with your router. And if the ISP didn't provide it, they're not going to help resolve it.
- In this situation, you might just need to replace the router; things do break from time to time. Or it might need updated firmware, or perhaps a reset back to the factory settings. The point is, knowing where to focus your troubleshooting efforts is the best way to get the situation resolved, and the simpler the configuration, the easier it will be to spot the culprit.

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- A word about wireless
- Please understand that wireless routers are a different matter entirely than something that runs on a wired (Ethernet) connection.
- Because it is a radio signal it is prone to interference.
- Common sources of interference are microwave ovens, cordless telephones, and baby monitors. These all operate on radio frequencies that overlap with wifi internet.

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- Bandwidth is typically less than a wired Ethernet router. Ethernet connections can be 100mbs to 1 Gbs (which includes our ONT connections). A typical Linksys wireless router will operate at speeds around 54mbs.

- These connectivity problems can be compounded by wifi shutoff switches on a laptop. These can be accidentally and unwittingly turned off by a customer who is not even aware of their existence.

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- Remember that many smartphone devices (i.e. Iphones and Droids), Game Consoles (i.e. Nintendo Wii, Microsoft Xbox 360, and Sony Playstation 3, along with handhelds), and Tablet Devices (Ipads, Droid Tablets, and Kindles) all run over wifi connections. These devices have the potential to cause network issues.

- Numerous devices or even living in an MDU with other Wireless Access Points nearby can cause some interference as well. This can cause intermittant loss of connectivity as well as odd network behavior.

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- Setting up a customer router.

- Usually a very simple process that only requires a web browser.

- AP's (Access Points) come in many types and brands.

- Some of the leading vendors are Netgear, Belkin, and Linksys (Note Linksys is the consumer products arm of Cisco)

Internet Troubleshooting

- Functionality varies by model and cost
- They are becoming more sophisticated as the need for home networking becomes greater
- They are typically designed to work out of the box so that all a customer has to do is plug it in to the ISP connection and it autoconfigures itself. While this is easy from a customer perspective it has several pitfalls.

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- The major pitfall is the default password.
- Mosts AP's come enabled with a well known and easily available (via the internet) username and password combo. This makes it easy for the home user to access and configure but also makes it easy for someone to maliciously access the same AP and effect the user experience.
- A malicious user who knows this password can take administrative control of someone else's router causing the user a lot of grief!
- We should be advising customers to set a password on these AP's if they are going to use them.
- We also do not guarantee these devices as we did not manufacture them or even test that particular model.

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- Another pitfall is encryption
- Most wifi routers have encryption turned off by default when you plug them in.
- This means that anyone within range of the AP can access the internet without a password!
- There are several kinds of encryption that use a password (encryption key) that must be entered on the end device (i.e. laptop, game system, etc.)
- Without the encryption key an end user cannot connect to the AP.

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- Types of encryption
- Open – No encryption at all and usually the default
- WEP – This was the first type of encryption that uses and easily hacked encryption password.   This can be accomplished in as little as five minutes depending on complexity
- WPA – This is the gold standard and uses a Key exchange that is tied to time and negotiated by both sides having access to the key. This can still be hacked but it is more difficult and is made more difficult by increasingly complicated keys

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- We should be advising customers to use WPA-TKIP. It is the best Encryption

- We should be advising customers to set their encryption keys to something hard to guess.

- Example= instead of [password] use [P@ssW0rd!]...mixtures of letters and numbers as well as special characters.

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- This training was intended to give an overview of network troubleshooting.

- If you get into a situation that you know very little about or it is beyond your understanding, escalate to the appropriate personnel.

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- Notes